

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF APPEALS AND INTERFERENCES

In re application of	)	
	)	
THEODORUS J. BROK, RUDOLF J. M. GROENEN,	)	
JEANINE M. KLINKENBIJL and MARIETTE C. KNAAP	)	
	)	
Serial No. 10/501,240	)	Group Art Unit: 1797
	)	
Filed March 30, 2005	)	Examiner: Ives J. Wu
	)	
PROCESS FOR REMOVING CARBON DIOXIDE	)	October 13, 2008
FROM GAS MIXTURES	)	
	)	

COMMISSIONER FOR PATENTS  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

REPLY BRIEF

This brief is filed in reply to the Examiner's Answer mailed September 4, 2008, which included new grounds of rejection. It is respectfully requested that the Board reverse the final rejection claims 1-4, 9, 12-16, 20 and 23 for the reasons discussed below as well as those presented in the Appeal Brief filed August 13, 2008.

**Reply to New Grounds of Rejection**

The rejection of claims 1-4, 9, 12-16, 20 and 23 under 35 U.S.C. §102 (b) as being anticipated by or, in the alternative, under U.S.C. 103(a) as obvious over Wagner et al (U.S. 4,997,630), is erroneous and should be reversed.

On page 6 of the Examiner's Answer, in response to Appellant's arguments, the Examiner states that:

“The broad range of each component disclosed by Wagner et al (US04997630) such as MDEA (even optional such as piperazine, sulfolane) include the specific range of same component in Applicants’ aqueous washing solution except range of water overlapped shown by the Example of Wagner et al where no piperazine or sulfolane is in the aqueous wash solution in the Example. Therefore it would be obvious to have the specific range as claimed by Applicants. Moreover, disclosed examples and preferred embodiments do not constitute teaching away from a broad disclosure or nonpreferred embodiments. *In re Susi*, 440 F.2d 442, 169 USPQ 423 (CCPA 1971).”

As best Appellant can understand from the above quoted response, it appears the Examiner continues to maintain the present claims are anticipated by Wagner et al even though there is no specific concentration range for water disclosed in Wagner et al, and even though the percentage of water in the sole example of Wagner et al (i.e., 50 wt%) is outside the range specified in Appellant’s claims, and even though two of the required components of Appellant’s washing solution (piperazine and sulfolane) are optional in Wagner et al’s aqueous absorption solution.

It further appears the Examiner believes that, even if the concentration ranges for water and the other required components of Appellant’s aqueous wash solution are not anticipated by Wagner et al, these ranges would be obvious because Applicants’ specific ranges are within the broad ranges disclosed in Wagner et al, and because disclosed examples and preferred embodiments do not constitute a teaching away from a broad disclosure or nonpreferred embodiments, as held in *In re Susi*.

Appellant will address both the rejection based on anticipation and the rejection based on obviousness in the following sections.

### **Response to Rejection of Claims Based on Anticipation**

Regarding the Examiner’s position on anticipation, it is well established that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir.1987). Appellant respectfully

submits that Wagner et al does not expressly or inherently describe each and every element set forth in the present claims for at least the following reasons:

(1) Wagner et al does not teach concentration range for water specified in the present claims, and in the sole specific example of an aqueous absorption solution, employs a water concentration outside of the range specified in the present claims. The Examiner attempts to overcome the lack of a disclosure in Wagner et al of a specific water concentration range, by contending that since the “balance” of the aqueous absorption solution in Wagner et al is water, the aqueous absorption solution of Wagner et al may contain from 15 to 45 parts water as specified in the present claims. However, this is not at all clear, since as explained in the Appeal Brief, Wagner et al teaches three possible concentration ranges for MDEA (20-70 wt%, 30-65 wt% and 40-60 wt%), and three possible concentration ranges for a physical solvent (1-60 wt%, 10-50 wt% and 20-40 wt%), if a physical solvent is even used. Thus, depending on how these ranges are combined, the “balance” of water in the absorption liquid of Wagner et al could range anywhere from a high of 79 %w, if the absorption liquid contained the minimum amounts of MDEA and physical solvent (100% – (20% MDEA+1% physical solvent)), to a “balance” of water close to zero if the absorption liquid contained the maximum amounts of MDEA and physical solvent in the ranges specified by Wagner et al (i.e., 70 % MDEA and 60% physical solvent).

(2) Wagner et al teaches that the addition piperazine is not necessary, rather it is optional, while in Appellant’s washing solution a specified concentration of piperazine is required in order to achieve the desired benefits of the invention. These benefits include faster carbon dioxide absorption rates resulting in higher CO<sub>2</sub> loadings, lower solvent/gas ratios allowing smaller plant size and lower regeneration heat requirement as discussed on page 4 of the present specification, lines 3-16.

(3) Wagner et al teaches that the addition of a physical solvent is optional, and sulfolane is only one of a number of physical solvents which can be optionally used. Furthermore, Appellant employs piperazine and sulfolane at concentrations that the prior art teaches will result in the formation of insoluble carbamates, as discussed in the Appeal Brief and in the following section of this Reply Brief in connection with the obviousness rejection.

For all these reasons, Appellant maintains that Wagner et al does not teach each and every element of the unique washing solution recited in the present claims with sufficient specificity to sustain an anticipation rejection.

### **Response to Rejection of Claims Based on Obviousness**

Regarding the Examiner's position on obviousness, Appellant never argued that the example in Wagner et al constituted a "teaching away". Appellant merely pointed in response to the anticipation rejection in the Final Office Action (which was the only grounds of rejection in the Final Office Action) that the only specific example of an aqueous absorption solution in Wagner et al did not contain two of the components required by Appellant's claims (piperazine and sulfolane), and that the concentration of a third component (50 wt% water) was outside of the range specified in Appellant's claims. Therefore, the aqueous absorption solution in the example in Wagner et al did not anticipate the present claims. Appellant never contended the example in Wagner et al constituted a "teaching away".

However, Appellant does believe that the prior art as a whole teaches away from the aqueous washing solution employed in the process recited in Appellant's claims. However, this "teaching away" is based on a different reason. A reason that was discussed in the Appeal Brief, but was not addressed in the Examiner's Answer. This reason concerns Applicants' discovery that a mixture of water and a specific physical solvent, i.e., sulfolane, can be used at a relatively high concentration in conjunction with piperazine and certain other amines without the formation of undesirable insoluble carbamates. This is contrary to the teachings of US 4,336,233 (which is discussed on page 3 of the specification, lines 5-19, and a copy of which is included in the Evidence Appendix). In col. 3, lines 29-35 of US 4,336,233 it is stated "that amongst industrially used physical solvents, e.g., methanol, mixtures of cyclotetramethylenesulfone, DIPA and water (Sulfinol ®), NMP and dimethyl ethers of polyethylene glycols (Selexol ®), only very dilute aqueous solutions can be used together with piperazine, because of the formation of piperazine carbamate." (emphasis added). Applicants have surprisingly found that such limitations do not occur when mixtures of water/sulfolane are used in certain proportions with piperazine and MDEA. This is the "teaching away" from the prior art on which Appellant relies to demonstrate the unobviousness of the unique aqueous washing solution recited in the present claims.

Appellant also notes that the example in Wagner et al is consistent with the teachings of US 4,336,233, in that no physical solvent or piperazine is employed in the 50 wt % aqueous methyldiethanolamine absorption solution used in example. According to the teachings of US 4,336,233, if piperazine and a significant concentration of physical solvent such as sulfolane had been added to the aqueous methyldiethanolamine solution in the example in Wagner et al, the formation of insoluble piperazine carbamate would result. Thus, the prior art taken as a whole teaches away from Appellant's aqueous washing solution which contains a significant concentration of a physical solvent (between 15 and 40 parts of sulfolane) and from 0.7 mol/l to 0.9 mol/l of piperazine. In other words, in view of the teachings of US 4,336,233, it would not be obvious to modify the aqueous methyldiethanolamine solution in the example in Wagner et al by adding piperazine and from 15 to 40 parts by weight of sulfolane.

For all of the above reasons, as well as those presented in the Appeal Brief, it is believed that claims 1-4, 9, 12-16, 20 and 23 are patentable over Wagner et al. Accordingly, it is respectfully requested that the action of the Examiner in finally rejecting these claims be reversed.

Respectfully submitted,

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